

Chapter 9: Practice Questions – Sampling Distributions of a Proportion

Question 1:

The probability of success on any trial of a binomial experiment is 25%.

- a. Find the probability that the proportion of successes in a sample of 500 is less than 22%.
- b. Repeat part (a) with $n = 800$.
- c. Repeat part (a) with $n = 1,000$.

Question 2:

A university bookstore claims that 50% of its customers are satisfied with the service and prices.

- a. If this claim is true, what is the probability that in a random sample of 600 customers less than 45% are satisfied?
- b. Suppose that in a random sample of 600 customers, 270 express satisfaction with the bookstore. What does this tell you about the bookstore's claim?

Solutions:

Question 1:

$$\text{a. } P(\hat{P} < .22) = P\left(\frac{\hat{P} - p}{\sqrt{p(1-p)/n}} > \frac{.22 - .25}{\sqrt{(.25)(1-.25)/500}}\right) = P(Z < -1.55) = .0606$$

$$\text{b. } P(\hat{P} < .22) = P\left(\frac{\hat{P} - p}{\sqrt{p(1-p)/n}} > \frac{.22 - .25}{\sqrt{(.25)(1-.25)/800}}\right) = P(Z < -1.96) = .0250$$

$$\text{c. } P(\hat{P} < .22) = P\left(\frac{\hat{P} - p}{\sqrt{p(1-p)/n}} > \frac{.22 - .25}{\sqrt{(.25)(1-.25)/1000}}\right) = P(Z < -2.19) = .0143$$

Question 2 :

$$\text{a. } P(\hat{P} < .45) = P\left(\frac{\hat{P} - p}{\sqrt{p(1-p)/n}} < \frac{.45 - .50}{\sqrt{(.50)(1-.50)/600}}\right) = P(Z < -2.45) = .0071$$

b. The claim appears to be false.